

WHAT IS CLAIMED IS:

1. An optical recording medium recorded with information on a substrate, comprising:

a first region having first information recorded at least in a depth direction of a plane direction and depth direction of said substrate, and

a second region having second information recorded in the plane direction of said substrate.

2. The optical recording medium according to claim 1, wherein said first information is recorded in said first region at least in said depth direction by at least a depth of a pit of the presence/absence, the length, the width, the position and the depth of the pit formed on said substrate, and said second information is recorded in said second region in said plane direction by at least one of the presence/absence, the length, the width, and the position of a pit formed on said substrate.

3. The optical recording medium according to claim 2, wherein said first region has said first information recorded in said depth direction by said pits having at least two different depths.

4. The optical recording medium according to claim 3, wherein a tangential push-pull signal differing in polarity according to the depth of a pit is obtained from said pits having at least two different depths when reproducing said first information from said first region.

5. The optical recording medium according to claim 3, wherein said two different depths of said pits are set so as to satisfy:

$$\lambda/8n < D1 < \lambda/4n \text{ and } \lambda/4n < D2 < 3\lambda/8n$$

where D1 and D2 are the respective two different depths, λ is a wavelength of light used in reproducing said first information, and n is a refractive index of said substrate.

6. The optical recording medium according to claim 1, wherein said first information recorded in said first region includes additional information required for reproduction of said optical recording medium.

7. The optical recording medium according to claim 6, wherein said additional information includes information inhibited of being copied into another recording medium.

8. The optical recording medium according to claim 6, wherein said second information recorded in said second region includes main information.

9. The optical recording medium according to claim 8, wherein said additional information includes information required for reproduction of said main information.

10. The optical recording medium according to claim 9, wherein said additional information includes key information to cancel scrambling or encryption of said main information.

11. The optical recording medium according to claim 6, wherein said additional information includes information unique to said optical recording medium itself.

12. The optical recording medium according to claim 11, wherein said additional information includes information to identify said optical recording medium.

13. The optical recording medium according to claim 3, wherein the presence of pits of different depths itself is the information to identify said optical recording medium.

14. A reproduction method of an optical recording medium

recorded with information on a substrate, said optical recording medium including a first region having first information recorded at least in a depth direction of said substrate by pits of at least two different depths formed on said substrate, and a second region having second information recorded in a plane direction of said substrate by at least one of the presence/absence, the length, the width and the position of a pit formed on said substrate, said reproduction method comprising the steps of:

reproducing said first information in said first region based on a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit, and

reproducing said second information in said second region based on a signal representing a quantity of reflected light obtained from said pit.

15. A reproduction method of an optical recording medium recorded with information on a substrate, said optical recording medium including a first region having first information recorded at least in a depth direction of said substrate by pits of at least two different depths formed on said substrate, and a second region having second information recorded in a plane direction of said substrate by at least one of the absence/presence, the length, the width and the position of a pit formed on said substrate, said reproduction method comprising the steps of:

reproducing said first information in said first region based on a signal representing a quantity of reflected light obtained from said pit and a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit, and

reproducing said second information in said second region based on said signal representing the quantity of reflected light obtained from said pit.

16. A reproduction apparatus of an optical recording medium recorded with information on a substrate, said optical recording medium including a first region having first information recorded at least in a depth direction of said substrate by pits of at least two different depths formed on

5 said substrate, and a second region having second information recorded in a plane direction of said substrate by at least one of the presence/absence, the length, the width and the position of a pit formed on said substrate, said reproduction apparatus comprising:

10 a circuit reproducing said first information in said first region based on a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit, and

a circuit reproducing said second information in said second region based on a signal representing the quantity of reflected light obtained from said pit.

17. A reproduction apparatus of an optical recording medium recorded with information on a substrate, said optical recording medium including a first region having first information recorded at least in a depth direction of said substrate by pits of at least two different depths formed on said substrate, and a second region having second information recorded in a plane direction of said substrate by at least one of the presence/absence, the length, the width and the position of a pit formed on said substrate, said reproduction apparatus comprising:

10 a circuit reproducing said first information in said first region based on a signal representing a quantity of reflected light obtained from said pit, and a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit, and

15 a circuit reproducing said second information in said second region based on said signal representing the quantity of reflected light obtained from said pit.

18. A recorded information identification method of an optical recording medium recorded with information on a substrate, said optical recording medium including a region in which the presence of pits having at least two different depths formed on said substrate indicates identification information that is unique to said optical recording medium, said identification method comprising the steps of:

detecting a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit in said region, and

10 identifying said unique identification information based on said detected polarity.

19. A recorded information identification apparatus of an optical recording medium recorded with information on a substrate, said optical recording medium including a region in which the presence of pits having at least two different depths formed on said substrate indicates identification information that is unique to said optical recording medium, said
5 recognition apparatus comprising:

a circuit detecting a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit in said region, and

10 a circuit identifying said unique identification information based on said detected polarity.

20. An optical recording medium that can have information recorded on a substrate, comprising:

a first region having first information recorded at least in a depth direction of a plane direction and depth direction of said substrate, and

5 a second region that can have second information recorded in the plane direction of said substrate.

21. The optical recording medium according to claim 20, wherein said first information is recorded in said first region at least in said depth direction by at least a depth of a pit of the absence/presence, the length, the width, the position and the depth of the pit formed on said substrate, and
5 said second information is recorded in said second region in said plane direction by at least one of the presence/absence, the length, the width, and the position of a mark formed on said substrate.

22. The optical recording medium according to claim 21, wherein said first region has said first information recorded in said depth direction by said pits having at least two different depths.

23. The optical recording medium according to claim 22, wherein a tangential push-pull signal differing in polarity according to the depth of a pit is obtained from said pits having at least two different depths when reproducing said first information from said first region.

24. The optical recording medium according to claim 22, wherein said two different depths of said pits are set so as to satisfy:

$$\lambda/8n < D1 < \lambda/4n \text{ and } \lambda/4n < D2 < 3\lambda/8n$$

where D1 and D2 are the respective two different depths, λ is a wavelength of light used in reproducing said first information, and n is a refractive index of said substrate.

25. The optical recording medium according to claim 20, wherein said first information recorded in said first region includes additional information required for reproduction of said optical recording medium.

26. The optical recording medium according to claim 25, wherein said additional information includes information inhibited of being copied into another recording medium.

27. The optical recording medium according to claim 25, wherein said second information that can be recorded in said second region includes main information.

28. The optical recording medium according to claim 27, wherein said additional information includes information required for reproduction of said main information.

29. The optical recording medium according to claim 28 wherein

said additional information includes key information to cancel scrambling or encryption of said main information.

30. The optical recording medium according to claim 25, wherein said additional information includes information unique to said optical recording medium itself.

31. The optical recording medium according to claim 30, wherein said additional information includes information to identify said optical recording medium.

32. A reproduction method of an optical recording medium that can have information recorded on a substrate, said optical recording medium including a first region having first information recorded at least in a depth direction of said substrate by pits of at least two different depths formed on said substrate, and a second region that can have second information recorded in a plane direction of said substrate by at least one of the presence/absence, the length, the width and the position of a mark formed on said substrate, said reproduction method comprising the steps of:

reproducing said first information in said first region based on a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit, and

reproducing said second information in said second region based on a signal representing a quantity of reflected light obtained from said mark.

33. A reproduction method of an optical recording medium that can have information recorded on a substrate, said optical recording medium including a first region having first information recorded at least in a depth direction of said substrate by pits of at least two different depths formed on said substrate, and a second region that can have second information recorded in a plane direction of said substrate by at least one of the absence/presence, the length, the width and the position of a mark formed on said substrate, said reproduction method comprising the steps of:

10 reproducing said first information in said first region based on a
signal representing a quantity of reflected light obtained from said pit and a
polarity of a tangential push-pull signal obtained from said pits, said
polarity differing according to the depth of a pit, and

15 reproducing said second information in said second region based on
said signal representing the quantity of reflected light obtained from said
mark.

34. A reproduction apparatus of an optical recording medium that
can have information recorded on a substrate, said optical recording medium
including a first region having first information recorded at least in a depth
direction of said substrate by pits of at least two different depths formed on
5 said substrate, and a second region that can have second information
recorded in a plane direction of said substrate by at least one of the
presence/absence, the length, the width and the position of a mark formed
on said substrate, said reproduction apparatus comprising:

10 a circuit reproducing said first information in said first region based
on a polarity of a tangential push-pull signal obtained from said pits, said
polarity differing according to the depth of a pit, and

a circuit reproducing said second information in said second region
based on a signal representing the quantity of reflected light obtained from
said mark.

35. A reproduction apparatus of an optical recording medium that
can have information recorded on a substrate, said optical recording medium
including a first region having first information recorded at least in a depth
direction of said substrate by pits of at least two different depths formed on
5 said substrate, and a second region that can have second information
recorded in a plane direction of said substrate by at least one of the
presence/absence, the length, the width and the position of a mark formed
on said substrate, said reproduction apparatus comprising:

10 a circuit reproducing said first information in said first region based
on a signal representing a quantity of reflected light obtained from said pit

and a polarity of a tangential push-pull signal obtained from said pits, said polarity differing according to the depth of a pit and

a circuit reproducing said second information in said second region based on said signal representing the quantity of reflected light obtained from said mark.

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